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			2859	

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Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/067,429

Applicant(s)

VISSER ET AL.

Examiner

Tiffany A Fetzner

Art Unit

2859

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 06/01/2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **Final Action**

1. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

### **Priority**

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### **Drawings**

3. The proposed red-ink drawing correction to figure 1 of June 16<sup>th</sup> 2003, which labels Figure 1 as prior art is approved by the examiner

### **Specification**

4. The objections to the disclosure from the May 2<sup>nd</sup> 2003 office action are rescinded in view of applicant's June 16<sup>th</sup> 2003 amendment.

### **Response to Arguments**

5. Applicant's arguments filed June 16<sup>th</sup> 2003 have been fully considered but they are not persuasive. Applicant argues that the amended feature of "**via one particular path of at least two possible paths**" distinguishes applicant's claims from the prior art of record. [See Amended claims 1 and 9], however the actual claim limitation in context requires "a control unit which controls at least one switch that selectively routes at least one detected RF signal towards separate receiver channels **via one particular path of at least two possible paths**". This feature merely requires that at a minimum, one switch which optionally routes **one or more**, detected RF signal(s), due to the "at least one" terminology toward a separate receiver channel, when there are at least two possible receiver pathways. Contrary to applicant's argument on page 7 paragraph 1, of the June 1<sup>st</sup> 2004 response. Applicant's claim fails to require "**selectively routing each**

**signal** via one particular path of at least two possible paths prior to being combined with another signal". The feature of "**selectively routing each signal** via one particular path of at least two possible paths prior to being combined with another signal", is not the same, and is not equivalent to "selectively" routing "**at least one detected RF signal** towards separate receiver channels via one particular path of at least two possible paths". Applicant's arguments contradict what is actually claimed in the June 1<sup>st</sup> 2004 amendment response.

6. Applicant's arguments filed 06/01/2004 have been fully considered but they are not persuasive. The examiner notes that applicant's amended claims fail to provide a distinction over the prior art of record, because applicant's claims with the "at least one" terminology of the amended claims fail to provide a clear indication of how the detected signals are now combined based on the amendments to the claims. Applicant claims at least two sets of at least two RF coils, (i.e. a minimum of at least four RF coils) where the signals from the at least four RF coils are processed by at least two receiver channels. The amended terminology of the June 1<sup>st</sup> 2004 response creates ambiguity in the path applicant is claiming for the combining of the detected RF signals, because applicant fails to reference the RF coil set(s), or receiver(s) from which the detected RF signals are combined. The numerous possibilities created by applicant's "at least one" amended claim terminology, with the lack of proper referencing to the coil set or receiver channel for "each" detected RF signal, in the control unit (claim 1) / controlling step (Claim 9) limitations of the June 1<sup>st</sup> 2004 amended claims still result in the prior art of record reading on applicant's amended claims. Therefore a final rejection in view of applicant's amended claims is proper.

7. The examiner attempted to contact applicant's representative for a telephonic interview, on August 13<sup>th</sup>, 16<sup>th</sup>, 18<sup>th</sup>, 19<sup>th</sup>, 20<sup>th</sup> and 22<sup>nd</sup> 2004 however no formal interview was conducted because the applicant's representative was recovering from an injury and unavailable to conduct an interview with the examiner.

8. Figure 5 of **Vij et al.**, shows that the signals from loops 40, 42, 44 and 46 are separately received.] **Vij et al** teaches the imaging parameters, gradient means, and excitation means of a typical axial imaging sequence generate NMR signals that are

detected by the RF coils and recorded as an NMR signal. [See col. 1 lines 13-61]. **Vij et al** also teaches and shows “decoupling circuit 64” which is a functional “control unit for selectively routing at least one detected rf signal towards separate receiver channels via one particular path of at least two possible paths; [See figure 5 where there are four decoupling circuits 64, and where each detected RF signal follows one of the four possible paths towards separate receiver channels], and where each path is directed to a separate combining networks 82, 86 “for combining the RF signals of at least two RF coils” [See Figure 5] depending on the imaging parameters and for applying the combined RF signals to separate receiver channels, such that at least two detected RF signals (I.e. 66, 68; or 62, 70) can be combined to form a combined signal (I.e. 84, or 88) and the combined signal (I.e. 84, or 88) is applied to one particular receiver channel.” [See the inputs 88 and 84 which are single channel outputs from the combined channel inputs of combining network 82, 86; that are fed into hybrid combiner 90 to produce final output signal 92]. The examiner also notes that applicant should see Figure 5, decoupling circuit 64, combining networks 82, 86, output signals 84, 88, and hybrid combiner 90, col. 6 line 62 through col. 8 line 63.

9. With respect to applicant’s June 16<sup>th</sup> 2003, and June 1<sup>st</sup> 2004 argument that the quadrature signals of **Burl et al.**, are not applied to a single receiver channel. The examiner notes that col. 5 lines 38-40 specifically teach combining quadrature signals as a single channel. Therefore applicant’s argument of page 9 paragraph 2 through page 10 paragraph 2 of the June 13<sup>th</sup> 2003 amendment response is not persuasive. Additionally, **Burl et al.**, shows selectively routing at least one detected rf signal towards separate receiver channels via one particular path of at least two possible paths; [See figure 2 where switch 44<sub>1</sub> or 44<sub>2</sub> directs each detected RF signal towards one of the two possible channel paths of the separate receiver channels].

10. With respect to applicant’s June 1<sup>st</sup> 2004 argument that the **Misic** reference does not disclose or suggest structure for **selectively routing each signal input via one particular path of at least two possible paths** prior to being combined with another signal. To the best of Applicants’ understanding of the coil interface described by Misic, each signal is routed along a fixed route. There is no disclosure by Misic that the Pin

diode RF **switches enable selective routing of each signal input via one particular path of at least two possible paths, ...**" [See the June 1<sup>st</sup> 2004 response paragraphs 1 and 2] The examiner notes that this argument is not persuasive because the claim does not require "**selective routing of each signal input via one particular path of at least two possible paths**", Applicant's terminology requires only at least one signal be selective, not that each signal is selective to separate, non-identical pathways as argued by applicant. Applicant is arguing features not claimed.

11. With respect to applicant's June 1<sup>st</sup> 2004 arguments that the dependent claims should be allowed because the amended independent claim rejections should be withdrawn, [See the June 13<sup>th</sup> 2003 amendment response page 9 paragraph 2 through page 14 paragraph 1] the examiner is not persuaded.

12. With respect to applicant's June 1<sup>st</sup> 2004 argument that the **Srinivasan et al.**, reference does not disclose or suggest structure for **selectively routing at least one detected signal via one particular path of at least two possible paths**" [See the June 1<sup>st</sup> 2004 response page 13 paragraph 2] The examiner notes that the **Srinivasan et al.**, reference shows structure for **selectively routing at least one detected signal via one particular path of at least two possible paths**" " [See figure 4, and figures 9, 10, and table 1 where the different channels are selected by the controlling interface device of col. 9 line 36 through col. 10. The examiner notes that figures 4, 9, and 10 show at least four different signal pathways and depending on the configuration of Table 1, at least one RF signal is routed via one particular path of at least two possible paths". In head only mode the two possible paths are ch1 and ch2, in Neck only mode the possible paths are ch3, and ch4, RF signals are; and in head/neck mode the possible paths are ch1, ch2, ch3, and ch4. Therefore applicant's argument is not persuasive.

### **Claim Rejections - 35 USC § 102**

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Art Unit: 2859

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

14. **Amended Claims 1, 7, 9** are rejected under **35 U.S.C. 102(b)** as being anticipated by **Vij et al.**, US patent 5,370,118 **are maintained and made final**.

15. With respect to **Amended Claim 1**, and corresponding **Amended method claim 9, Vij et al.**, teaches and shows "A magnetic resonance imaging apparatus / method comprising: an RF coil system comprising at least two sets of at least two RF coils which detects ~~[for detecting]~~ RF signals from a region of interest," [See abstract, Figure 5, col. 4 lines 7-25] "at least two receiver channels which receive and process ~~[for receiving and processing]~~ the detected RF signals," [See Figure 5, which suggests at least four channels (i.e. 62, 70; 66, 68) "and a "control unit" [See Decoupling circuit 64 taught in col. 7 lines 43-54 to include a diode that may be forward biased by an independent source of DC power to allow a current to flow across capacitor 50. Because the conditions of forward biasing control when each of the four coils (i.e. 40, 42, 44, 46) are active, decoupling circuit 64 is a control unit "~~[for]~~ which controls at least one switch (i.e. diode network 52) that selectively routes ~~[routing]~~ at least one detected rf signal towards separate receiver channels; via one particular path of at least two possible paths" as amended by applicant. [See the response to arguments concerning the **Vij et al.**, reference above]. **Vij et al.**, also teaches and shows combining networks 82, 86 "said at least one RF signal is combined with an ~~[for combining the]~~ RF signal [signals] of at least two RF coils" [See Figure 5] depending on the imaging parameters, said control unit (i.e combining network 82, 86) applies ~~[and for applying]~~ "the combined RF signals to separate receiver channels, such that at least two detected RF signals (i.e. 66, 68; or 62, 70) can be combined to form a combined signal (i.e. 84, or 88) and the combined signal (i.e. 84, or 88) is applied to one particular receiver channel." [See

the inputs 88 and 84 which are single channel outputs from the combined channel inputs of combining network 82, 86; that are fed into hybrid combiner 90 to produce final output signal 92]. The examiner also notes that applicant should see Figure 5, decoupling circuit 64, combining networks 82, 86, output signals 84, 88, and hybrid combiner 90, col. 6 line 62 through col. 8 line 63. [See also the response to arguments given above.]

16. With respect to **Amended Claim 7** and corresponding **new method claim 15**, **Vij et al.**, teaches and shows "said control unit) (i.e. combining network 82, 86) is provided to select and/or combine the RF signals of at least two RF coils." [See Figure 5 combining networks 82, 86, and hybrid combiner 90, col. 4 lines 27-32; col. 6 line 62 through col. 8 line 63.] "is provided to select and/or combine the RF signals of at least two RF coils depending on the phase encoding direction."

17. **Amended Claims 1-7**, and **9-15** are rejected under **35 U.S.C. 102( e )** as being anticipated by **Burl et al.**, US patent 6,377,044; **are maintained and made final**.

18. With respect to **Amended Claim 1**, and corresponding **amended method claim 9**, **Burl et al.**, teaches and shows "A magnetic resonance imaging apparatus comprising: an RF coil system comprising at least two sets of at least two RF coils which detects [~~for detecting~~] RF signals from a region of interest," [See Figure 4 where: coils 100<sub>1</sub>, 100<sub>2</sub>, 100<sub>3</sub>, 100<sub>4</sub>, comprise a first set of four coils; coils 102<sub>1</sub> 102<sub>2</sub> 102<sub>3</sub> 102<sub>4</sub> comprise a second set of four coils; or coils (100<sub>1</sub>, and 102<sub>1</sub>), (100<sub>2</sub> and 102<sub>2</sub>), (100<sub>3</sub>, and 102<sub>3</sub>), and (100<sub>4</sub>, and 102<sub>4</sub>) comprise four sets of two coils as taught in col. 4 lines 24-49 ] **Burl et al.**, also teaches and shows "at least two receiver channels which receive and process [~~for receiving and processing~~] the detected RF signals" [See Figures 1 through 4]

19. **Burl et al.**, also teaches and shows "a control unit" [See switch assembly 40; receivers 46, 48 Figures 1-4; the sequence control processor, and teachings of col. 4 line 18 through col. 5 line 49] "~~for~~ which controls at least one switch (i.e. switch components 44<sub>1</sub>, 44<sub>2</sub>, col. 4 line 43 through col. 5 line 12) that selectively routes [~~routing~~] at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths" as amended by applicant. [See the response to



arguments concerning the **Burl et al.**, reference above.], said at least one RF signal is combined with an ~~[for combining the]~~ RF signal [signals] of at least two RF coils" [See Figures 1-4] "depending on the imaging parameters, said control unit (i.e. switch circuit 40; col. 4 line 43 through col. 5line 12) applies ~~[and for applying]~~ "the combined RF signals to separate receiver channels, [See col. 4 lines 18-42; and col. 4 line 60 through col. 5 line 5 where the specified imaging parameters, controlled by sequence control processor 50, generate or initiate, the presence or absence of a DC biasing potential that controls the functional mode of the **Burl et al.**, apparatus. The biasing potential is responsible for "applying the selected and/or the combined RF signals to the separate receiver channels, such that at least two detected RF signals (I.e. the quadrature and anti-quadrature signals) can be combined to form a combined signal [See col. 5 lines 20-23] and the combined signal is applied to one particular receiver channel." [See the sequence control processor, and teachings of col. 4 line 18 through col. 5 line 49, especially col. 5 lines 38 to 40 where the quadrature signals of butterfly, loop, ladder (i.e. a planar birdcage coil) are taught to be combined as a single channel and the response to arguments given above.]

20. With respect to **Amended Claim 2**, and corresponding **new method claim 10**, **Burl et al.**, teaches and shows "said control unit is provided to combine the RF signals of several groups of at least two RF coils (i.e coils 100<sub>1</sub>, 100<sub>2</sub>, 100<sub>3</sub>, 100<sub>4</sub>, comprise a first set of four coils; coils 102<sub>1</sub> 102<sub>2</sub> 102<sub>3</sub> 102<sub>4</sub> comprise a second set of four coils; or coils (100<sub>1</sub>, and 102<sub>1</sub>), (100<sub>2</sub> and 102<sub>2</sub>), (100<sub>3</sub>, and 102<sub>3</sub>), and (100<sub>4</sub>, and 102<sub>4</sub>) comprise four sets of two coils as taught in col. 4 lines 24-49 ], "into a separate receiver channel." [See the sequence control processor, and teachings of col. 4 line 18 through col. 5 line 49]

21. With respect to **Amended Claim 3**, and corresponding **new method claim 11**, **Burl et al.**, teaches and shows "said RF coil system (9, 10, 11, 12) comprises two sets of four RF coils." [See Figure 4 where: coils 100<sub>1</sub>, 100<sub>2</sub>, 100<sub>3</sub>, 100<sub>4</sub>, comprise a first set of four coils; coils 102<sub>1</sub> 102<sub>2</sub> 102<sub>3</sub> 102<sub>4</sub> comprise a second set of four coils; or coils (100<sub>1</sub>, and 102<sub>1</sub>), (100<sub>2</sub> and 102<sub>2</sub>), (100<sub>3</sub>, and 102<sub>3</sub>), and (100<sub>4</sub>, and 102<sub>4</sub>) comprise four sets of two coils as taught in col. 4 lines 24-49 ]

22. With respect to **Claim 4**, and corresponding **new method claim 12**, **Burl et al.**, teaches and shows "a birdcage head coil arrangement." [See col. 3 lines 30 through col. 4 line 17; Figure 1 component 28; col. 1 lines 33-47; and col. 5 lines 41-42 which teaches that the head piece coils, (i.e. the birdcage style head coils shown in Figure 1), can be conveyed to separate receiver channels.]

23. With respect to **Amended Claim 5**, and corresponding **new method claim 13**, **Burl et al.**, teaches and shows "said control unit is provided to combine the RF signals of RF coils arranged on opposite sides of the head." [See Figure 1 the sequence control processor component 50, and teachings of col. 3 line 30 through col. 5 line 49]

24. With respect to **Amended Claim 6**, and corresponding **new method claim 14**, **Burl et al.**, teaches and shows "said control unit is provided to combine the RF signals of neighboring RF coils." [See Figure 1 the sequence control processor component 50, and teachings of col. 3 line 30 through col. 5 line 49, especially col. 5 lines 23-42]

25. With respect to **Amended Claim 7**, and corresponding **new method claim 15**, **Burl et al.**, teaches and shows "said control unit is provided to select and/or combine the RF signals of at least two RF coils **depending** on the phase encoding direction." [See Figures 1, 2, 3, the sequence control processor component 50, and teachings of col. 3 line 30 through col. 5 line 49]

26. With respect to **Amended Claim 9**, **Burl et al.**, teaches and shows "A magnetic resonance imaging method, comprising the steps of: detecting RF signals from a region of interest while using an RF coil system comprising at least two sets of at least two RF coils", [See Figure 4 where: coils 100<sub>1</sub>, 100<sub>2</sub>, 100<sub>3</sub>, 100<sub>4</sub>, comprise a first set of four coils; coils 102<sub>1</sub> 102<sub>2</sub> 102<sub>3</sub> 102<sub>4</sub> comprise a second set of four coils; or coils (100<sub>1</sub>, and 102<sub>1</sub>), (100<sub>2</sub> and 102<sub>2</sub>), (100<sub>3</sub>, and 102<sub>3</sub>), and (100<sub>4</sub>, and 102<sub>4</sub>) comprise four sets of two coils as taught in col. 4 lines 24-49 ] "receiving and processing the detected RF signals while using at least two receiver channels, [See Figures 1 through 4; col. 4 line 18 through col. 5 line 49] "and controlling at least one switch (i.e. switch components 44<sub>1</sub>, 44<sub>2</sub>, col. 4 line 43 through col. 5 line 12) that selectively routes [routing] at least one detected rf signal towards separate receiver channels for combining the RF signals of at least two RF coils" [See Figures 1-4] depending on the imaging parameters and for

Art Unit: 2859

applying the combined RF signals to separate receiver channels, such that at least two detected RF signals can be combined to form a combined signal (and the combined signal) is applied to one particular receiver channel." [See the sequence control processor, and teachings of col. 4 line 18 through col. 5 line 49; and the rejection reasons of amended claim 1 which need not be reiterated.]

27. **Amended Claims 1, 2, 4-6, 9, 10 and 12-14** are rejected under **35 U.S.C. 102( e )** as being anticipated by **Misic** US patent 6,356,081 B1 issued March 12<sup>th</sup> 2002, filed November 24<sup>th</sup> 1999 **are maintained and made final.**

28. With respect to **Amended Claim 1**, and corresponding **amended method claim 9**, **Misic** teaches and shows "A magnetic resonance imaging apparatus comprising: an RF coil system comprising at least two sets of at least two RF coils which detects [~~for detecting~~] RF signals from a region of interest," [See Figures 1, 3, 4, 5, col. 2 lines 27-30] **Misic** also teaches and shows "at least two receiver channels which receive and process [~~for receiving and processing~~] the detected RF signals" [See Figures 2a, 2b; col. 1 lines 31-35; col. 1 lines 45-51; col. 4 line 1 through col. 6 line 42 which teach many different channel / component configurations.]

29. **Misic** also teaches and shows "a control unit" [See the coil interface component 100, of the abstract, in combination with the MRI system console, and the one or more PIN diode switches and teachings of col. 1 line 30 through col. 3 line 67, especially col. 3 lines 60-67] "~~for~~ which controls at least one switch (i.e. the PIN diode switch components taught throughout col. 3 that selectively routes [~~routing~~] at least one detected rf signal towards separate receiver channels via one particular path of at least two possible paths" as amended by applicant. [See the response to arguments concerning the **Misic** reference above.], said at least one RF signal is combined with an [~~for combining the~~] RF signal [signals] of at least two RF coils depending on the imaging parameters" [See abstract, col. 1 line 30 through col. 6 line 42] , "said control unit (i.e. the MRI console, which in combination with the coil interface 100 and the pin diodes) "applies [~~and for applying~~] "the combined RF signals to separate receiver channels, [See abstract, col. 1 line 30 through col. 6 line 42], "such that at least two detected RF signals can be combined to form a combined signal [See col. 2 lines 27-29; abstract;

Art Unit: 2859

col. 3 lines 31-42; col. 4 lines 16-25; col. 6 lines 6-25] and the combined signal is applied to one particular receiver channel." [See col. 2 lines 27-29; abstract; col. 3 lines 31-42; col. 4 lines 16-25; col. 6 lines 6-25].

30. With respect to **Amended Claim 2**, and corresponding **new method claim 10**, **Misic** teaches and shows "said control unit is provided to combine the RF signals of several groups of at least two RF coils into a separate receiver channel." [See abstract, col. 1 line 30 through col. 6 line 42]

31. With respect to **Amended Claim 4**, and corresponding **new method claim 12**, **Misic** teaches and shows "a birdcage head coil arrangement." [See Figures 1, 3, 4, 5, col. 2 lines 14-26; col. 3 lines 7-59 birdcage component 60.]

32. With respect to **Amended Claim 5**, and corresponding **new method claim 13**, **Misic** teaches and shows "said control unit is provided to combine the RF signals of RF coils arranged on opposite sides of the head." [See Figures 1, 3, 4, 5, column 3 and col. 6 lines 17-42.]

33. With respect to **Amended Claim 6**, and corresponding **new method claim 14**, **Misic** teaches and shows "said control unit is provided to combine the RF signals of neighboring RF coils." [See Figures 2a, 2b; abstract, col. 1 line 30 through col. 6 line 42.]

### ***Claim Rejections - 35 USC § 103***

34. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

35. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

36. **Amended Claims 1-6, and 9-14** are rejected under **35 U.S.C. 103( a )** as being obvious over **Srinivasan et al.**, US patent 5,664,568 issued September 9<sup>th</sup> 1997 **are maintained and made final.**

37. With respect to **Amended Claim 1**, and corresponding **amended method claim 9, Srinivasan et al.**, teaches and shows "A magnetic resonance imaging apparatus comprising: an RF coil system comprising at least two sets of at least two RF coils which detects ~~[for detecting]~~ RF signals from a region of interest," [See Figure 10, col. 10 lines 36-68 where: coils 152a, 152b, comprise a first set of coils; and coils 154a 154b comprise a second set of coils] **Srinivasan et al.**, also teaches and shows "at least two receiver channels which receive and process ~~[for receiving and processing]~~ the detected RF signals" [See Figures 10; col. 10 lines 36-68 especially col. 10 lines 40-43] . **Srinivasan et al.**, also teaches and shows "a control unit" [See the interface taught in col. 9 lines 58 –67; and figure 1 sequence controller component 60].

38. The ability to "selectively route ~~[routing]~~ at least one detected rf signal towards separate receiver channels via one particular path of at least two possible paths" as amended by applicant. [See the response to arguments concerning the **Srinivasan et al.**, reference above.], with "said at least one RF signal is combined with an ~~[for combining the]~~ RF signal [signals] of at least two RF coils" [See Figures 1-4] "depending on the imaging parameters" is taught by **Srinivasan et al.**, in col.. 10 lines 36-68, especially col. 10 lines 40-43. **Srinivasan et al.**, also teaches that "said control unit (i.e. the interface) "applies ~~[and for applying]~~ "the combined RF signals to separate receiver channels, [See col. 9 lines 50-67; and col. 10 lines 36-68, especially col. 10 lines 40-43. where the specified imaging parameters, controlled by sequence control processor 60, generate or initiate, the presence or absence of a voltage according to table 1 that controls the functional mode of the **Srinivasan et al.**, apparatus. The voltages are responsible for "applying the selected and/or the combined RF signals to the separate receiver channels, such that at least two detected RF signals (I.e. the signals from loop coils 152a, and 152b) can be combined to form a combined signal [See col. 10 lines 36-68,] "and the combined signal is applied to one particular receiver channel via one

**particular path of at least two possible paths.**" [See col. 10 lines 36-68; Figure 10; Figures 3, 9, 10, and table 1. See also the response to arguments concerning the **Srinivasan et al.**, reference above.]

39. **Srinivasan et al.**, lacks directly showing that the interface and / or the sequence controller 60 "controls at least one switch". However, the examiner notes that even though this feature is not directly shown or taught that it would have been obvious to one of ordinary skill in the art at the time that the invention was made, that the ability of the interface and / or the sequence controller 60 to "control at least one switch" is suggested from the **Srinivasan et al.**, reference because **Srinivasan et al.**, teaches that the coil has an MR interface, with the interface having "individual channel device drivers" with the imaging modes depending on whether the individual channels are "on" or "off" [See table 1 in col. 9] because the "individual channel device drivers" are capable of being "on" or "off" the examiner is interpreting the "individual channel device drivers" of col. 9 lines 50-67 in combination with TABLE 1 to represent the presence of at least one switch, within the interface and/or the sequence controller 60.]

40. With respect to **Amended Claim 2**, and corresponding **new method claim 10**, **Srinivasan et al.**, teaches that "said control unit is provided to combine the RF signals of several groups of at least two RF coils into a separate receiver channel." [See the sequence control processor 60, along with the RF channel interface, and teachings of col. 9 lines 50-67; col. 10 lines 36-68; especially col. 10 lines 40-43].

41. With respect to **Amended Claim 3**, and corresponding **new method claim 11**, **Srinivasan et al.**, teaches alternative embodiments which suggest that "said RF coil system may comprise two sets of four RF coils." [See col. 10 lines 36-68; col. 9 table 1 especially col. 10 lines 58-61 where **Srinivasan et al.**, teaches combining several quadrature coil pairs in a cascade manner to cover elongated anatomy under investigation.]

42. With respect to **Claim 4**, and corresponding **new method claim 12**, **Srinivasan et al.**, teaches and shows "a birdcage head coil arrangement." [See col. 9 line 35 through col. 10 line 68; Figures 1 through 6, Figures 9, 10]

43. With respect to **Amended Claim 5**, and corresponding **new method claim 13**, **Srinivasan et al.**, teaches and shows "said control unit is provided to combine the RF signals of RF coils arranged on opposite sides of the head." [See col. 6 lines 48-63 in combination with col. 10 lines 36-68, especially col. 10 lines 40-43; Figures 1 through 6, Figures 9, 10]

44. With respect to **Amended Claim 6**, and corresponding **new method claim 14**, **Srinivasan et al.**, teaches and shows "said control unit is provided to combine the RF signals of neighboring RF coils." [See Figure 10 and teachings of col. 10 lines 36-68]

45. **Amended Claim 3**, and **11** are rejected under **35 U.S.C. 103( a )** as being obvious over **Misic** US patent 6,356,081 B1 issued March 12<sup>th</sup> 2002, filed November 24<sup>th</sup> 1999 **are maintained and made final**.

46. With respect to **Amended Claim 3**, and corresponding **new method claim 11**, **Misic** lacks directly teaching or showing that "said RF coil system comprises two sets of four RF coils." However, **Misic** teaches a set of four coils, multiple sets of two RF coils, and the ability to substitute one or more sets of two coils, for one or more of the initially taught RF coils. [See col. 2 line 4 through col. 6 line 42. Additionally **Misic** teaches that more or fewer elements (i.e. coils, components) may be used than are described. [See col. 6 lines 32-42.] Therefore, It would have been obvious to one of ordinary skill in the art at the time that the invention was made that the ability to modify the coil arrangement described to comprise "two sets of four RF coils", is broadly suggested from the teachings of the **Misic** reference.

47. **Amended Claim 8** and corresponding **new method claim 16**, are rejected under **35 U.S.C. 103(a)** as being unpatentable over **Burl et al.**, US patent 6,377,044 as applied to **Amended claims 1-7**, and **9** above, and further in view of **Pruessmann et al.**, article "SENSE: Sensitivity encoding for Fast MRI" Magnetic Resonance in Medicine 42: pages 952-962 1999.

48. With respect to **Amended Claim 8**, and corresponding **new method claim 16**, **Burl et al.**, teaches and shows "said control unit is provided to select and/or combine the RF signals of at least two RF coils" [See Figures 1 through 4; col. 4 line 18 through col. 5 line 49].

49. **Burl et al.**, lacks directly teaching that the "selection and/or combination of the RF signals of at least two RF coils is depending on the desired SENSE reduction direction." However, SENSE, a conventional MRI multi-coil encoding procedure developed originally by Pruessmann et al., in 1999, is usable with FFE (i.e. fast field echo), TSE (i.e. turbo spin-echo), and half-Fourier EPI (i.e. echo-planar imaging) procedures, [See Pruessmann et al., page 958 col. 2 discussion paragraph] and **Burl et al.**, teaches the use of numerous procedures with the **Burl et al.**, device including: "any of a plurality of magnetic resonance imaging and spectroscopy sequences, such as echo-planar imaging, echo-volume imaging, gradient and spin-echo imaging, fast spin echo imaging and the like." [See **Burl et al.**, col. 4 lines 18-23] Therefore, It would have been obvious to one of ordinary skill in the art, at the time that the invention was made to modify the teaching of **Burl et al.**, to include SENSE MRI techniques because the type of imaging sequences for which SENSE is known to be usable, are producible by **Burl et al.**, apparatus.

50. Additionally, **Pruessmann et al.**, teaches and suggests that in conventional SENSE MRI methodology the reduction factor is bound by the number of coils used. [See page 953 col. 2 the first full paragraph], and that the geometry factor, (i.e. the arrangement of the coils around a patient, such as the arrangements shown on page 957 in Figure 3 of col. 1, and the phantom experiments section of page 957) of SENSE methodology allows the coil configuration to be freely optimized with respect to SNR, independently of coil and slice geometry. [See page 960 col. 1 paragraph 1 and page 960 col. 1 conclusion paragraph 1.] This teaching suggests that the used of a SENSE method results in an inherent reduction factor, related to the number of coils used or selected, and that the actual geometrical positioning of the coils is important, and also suggests applicant's limitation that the "selection and/or combination of the RF signals of at least two RF coils is in dependence on the desired SENSE reduction direction." [See **Pruessmann et al.**, RESULTS page 957 col. 1 through page 958 col. 2].

51. It would have been obvious to one of ordinary skill in the art, at the time that the invention was made that the geometrical arrangement of coils in the **Burl et al.**, apparatus would also have a "selection and/or combination of the RF signals of at least



two RF coils is in dependence on the desired SENSE reduction direction", when implemented in a SENSE procedure, because the coil arrangements taught in col. 5 lines 23-49 of **Burl et al.**, suggest geometrical arrangements of two, four, or more combined coils based on the geometrical anatomy to be imaged, therefore if the **Burl et al.**, reference was modified to include the teachings of **Pruessmann et al.**, SENSE methodology the limitation of combining signals based on the desired SENSE reduction, for a specific portion of patient anatomy would fall within the scope of the **Burl et al.**, reference.

52. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

53. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

54. The **prior art made of record** and not relied upon is considered pertinent to applicant's disclosure.

**A)** US patent 6,469,506 B1 issued October 22<sup>nd</sup> 2002, to **Felmlee et al.**, filed June 15<sup>th</sup> 2000 which shows multiple sets of two receiver coils in an MRI phased array coil where the signals from one coil or set are combined to form a single output image signal from the array of coils.

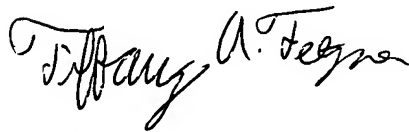
### **Conclusion**

55. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-

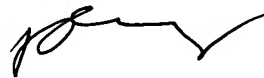
Art Unit: 2859

2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

56. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.



TAF  
August 23, 2004



Diego Gutierrez  
Supervisory Patent Examiner  
Technology Center 2800